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KNOWLEDGE AND AWARENESS ON VISUAL FEEDBACK ENHANCING ACTIVATION OF MUSCLE MOVEMENTS AMONG DENTAL STUDENTS

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ABSTRACT

Multi-modal sensory feedback such as proprioception and vision are integrated by humans to perform a novel sensorimotor task, which helps to make appropriate adjustments to complete the task successfully (Franklin et al., 2007). In order to enhance postural and balance control in sports and clinical training, visual feedback is an effective method (Wan et al., 2019). In a variety of motor disorders, visual biofeedback of muscle activity is helpful reducing excess muscle contraction (Young et al., 2011). To maintain balance, vision collects information about the location and movement of body segments. The main aim of this study was to create awareness and knowledge on visual feedback enhancing activation of muscle movements among dental students. Self-administrated questionnaire was designed based on awareness. The questionnaire was distributed through an online Google forms link in Which study population included 100 dental students of age 18- 26 years. Method of representation of

each output Variable was in pie chart form where descriptive statistics were used to create pie charts. The measure that was taken to minimize the sampling bias was that the validity was checked both internally and externally. The result was statistically analyzed using SPSS statistic 19 software. Poor vision has a powerful effect on balance, which causes postural change and imbalance that eventually decreases motion, whereas in this survey, 59% think systematic errors are produced in movement endpoints, when visual feedback of initial position is distorted. In other research it is found that Visual feedback may not be advantageous once a skill is well learned, here, 45 % think visual feedback method is advantageous in learning motor skills.This study concludes that the majority of the study participants were aware that multiple types of sensory information are integrated by the brain to achieve voluntary muscle movements. But more awareness has to be created on the visual feedback method as we alter our body movements in response to changing cues in our daily life.

INTRODUCTION

Multi-modal sensory feedback such as proprioception and vision are integrated by humans to perform a novel sensorimotor task, which helps to make appropriate adjustments to complete the task successfully (Franklin et al., 2007). In order to enhance postural and balance control in sports and clinical training, visual feedback is an effective method (Wan et al., 2019). In a variety of motor disorders, visual biofeedback of muscle activity is helpful reducing excess muscle contraction (Young et al., 2011). To maintain balance, vision collects information about the location and movement of body segments (Park et al., 2015). Specific amount of time is necessary to process visual feedback as the brain integrates multiple types of sensory information to achieve voluntary muscle control (Keele and Posner, 1968). With amplified visual feedback, there is a deficiency in movement control in children, which could be due to the immaturity of the cortical motor system and an ineffective use of visual feedback (Moon et al., 2015).

It is revealed that motor performance in a process that bypasses awareness can be influenced by altered visual feedback through body ownership illusions (Bourdin et al., 2019). It is not known upto what level visual information during movements contributes for learning of novel dynamics (Pak and Lee, 2020). Singing can increase muscle control in the throat and soft palate. For improving the performance of star excursion balance test in poster lateral direction, real- time visual feedback appears to be an effective means (Schwartz, 2016). Clinical benefits for treatment of children with dystonia is provided by method of biofeedback focusing inappropriate muscle activations (Juodzbaliene et al., 2016). Thyroid Disease is related with movement disorders among which tremor is most common. By monitoring the iodine content in our diet we can prevent thyroid dysfunction. Alterations in thyroid function seem to be affecting obese patients

Previously our team had conducted numerous research (Choudhari and Jothipriya, 2016)(R and Sethu, 2018) (Shruthi and Preetha, 2018)(Fathima and Preetha, 2016), survey based studies (Iyer, Devi and Priya, 2019)(David, Priya and Devi, 2019)(Abigail, Priya and Devi, 2019)(Dave and Preetha, 2016)(Rj and R, 2016)(Swathy and Sethu, 2015), review based studies (Baheerati and

R, 2018)(Samuel and Devi, 2015)(Renuka and Sethu, 2015)(Timothy, Devi and Priya, 2019)(Harsha*et al.*, 2015). Now we are focusing on epidemiological surveys. The idea for this stemmed from the current interest in our community.

There is no proper research or survey that has been done on visual feedback enhancing activation of muscle movements among animals. The main aim of this study was to create awareness and knowledge on visual feedback enhancing activation of muscle movements among dental students.

MATERIALS AND METHOD

Self-administrated questionnaire was designed based on awareness. The questionnaire contained 12 questions which were distributed through an online Google forms link. The study population included 100 dental students belonging to the 18 – 26 age group. The participants were explained about the purpose of study in detail. The questions were carefully studied and the participants marked the corresponding answers. The measure that was taken to minimize the sampling bias was the validity was checked both internally and externally. Sample method carried out was simple random sampling. Method of representation of each output variable was in pie chart form where descriptive statistics were used to create pie charts. The result was then statistically analyzed using SPSS statistic 19 software. The survey has been completed in the month of may 2020.

RESULT AND DISCUSSION

Survey on awareness and knowledge on visual feedback enhancing activation of muscle movements in which study population included dental students of 18 – 24 age group gave the result which was collected and statistically analyzed as 40% belonging to 18-20 age group, 37% belonging to 21-23 age group, 23% belonging to 24-26 age group [Figure 1]. 54% were female and 44% was male [Figure 2]. 58% were aware that the brain integrates multiple types of sensory information to achieve voluntary muscle control [Figure 3]. 63% feels visual feedback is as important as a sense of body position [Figure 4]. 54% feels vision is mainly used to define trajectory and kinematics on reaching movements [Figure 5]. 59% think when visual feedback of initial position is distorted, systematic errors in movement endpoint are produced [Figure 6]. 57% agrees visual information is critical in determining static limb position [Figure 7]. 60% feels visual feedback is effective during isokinetic exercise [Figure 8]. 45% think definitely visual feedback is advantageous in learning motor skills, 31% have no opinion on it and 24% think definitely not [Figure 9]. 65% feels humans use continuous visual feedback to control fast reaching movements [Figure 10]. 54% agrees visual feedback from a mirror during movement may reduce self-focused attention [Figure 11]. 57% were aware that biofeedback could provide auditory, visual or sensory feedback [Figure 12]. Association between gender and opinion on visual feedback methods is as important as a sense of body position in which, out of 63% of the participants who responded yes, 41% constitute female and 22% constitute male (Chi square Analysis P value = 0.008) hence statistically significant [Figure 13]. Association between gender and opinion on humans uses continuous visual feedback methods to control fast reaching movement in

which, out of 65% of the participants who responded yes, 37% constitute female and 28% constitute male (Chi square Analysis P value = 0.598) hence statistically non significant [Figure 14]. Association between gender and awareness that biofeedback methods can provide auditory, visual or sensory feedback in which, out of 57% of the participants who responded yes, 34% constitute female and 23% constitute male (Chi square Analysis P value = 0.282) hence statistically non significant [Figure 15]. Association between gender and awareness that the brain integrates multiple types of sensory information to achieve voluntary muscle control in which, out of 58% of the participants who responded yes, 29% constitute female and 29% constitute male (Chi square Analysis P value = 0.238) hence statistically non significant [Figure 16]. Association between gender and opinion on visual feedback method is effective during isokinetic exercise in which, out of 60% of the participants who responded yes, 36% constitute female and 24% constitute male (Chi square Analysis P value = 0.218) hence statisticallynon significant [Figure 17].

In previous research, it is revealed that the visual feedback may not be advantageous once a skill is well learned and feedback tends to decrease (Kim and Kramer, 1997). Here, 45% definitely thinks visual feedback is advantageous in learning motor skills, 31% feels maybe. Unintentional slow drift of referent body orientation towards actual body orientation leads to drift (Dube and Roy, 2019). 54% agrees visual feedback from a mirror during movement may reduce self-focused attention. Obese people have lot of risk factors like high cholesterol and high blood pressure, stroke, sleep apnea and so on which may eventually affect the visual feedback method as Poor vision has a powerful effect on balance, which causes postural change and imbalance that eventually decreases motion (Gentil et al., 2017), whereas in this survey, 59% think systematic errors are produced in movement endpoints, when visual feedback of initial position is distorted. High levels of muscle activation independent of training, status, dominance, movement velocity and visual feedback are produced by No-load resistance training (Leinen et al., 2015). 54% feels vision is mainly used to define kinematics and trajectory on reaching movements. Reaching task performance had been impacted by lack of visual feedback while fatigue did not have an impact and also fatigue does not increase the effect of lack of visual feedback (Yamagata et al., 2019). And also sleep plays a major role in performing numerous functions in the body such as enhancing safety and alertness when performing different tasks. Sleeplessness is majorly due to stress, emotional stress can provoke both acute and chronic asthma. Physiological changes such as back, neck, or shoulder pain is caused because of optimal seated postures where more than one-half of the muscles of the body are contracted statically, which in turn, has a great impact on their productivity and ultimately reduces their quality of life. Low back pain is a common musculoskeletal disorder characterised muscular tension where acupuncture is effective in treating lower back pain. 57% agrees visual information is critical in determining static limb position. There is no research or survey that has been done on visual feedback enhancing activation of muscle movements among animals.

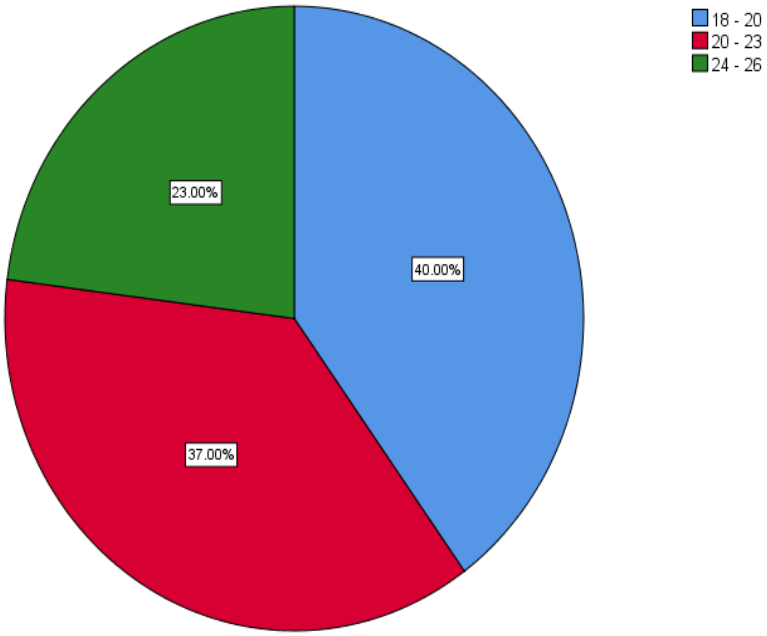


Figure 1 Pie chart represents age of participants in the study which shows response for the question on age. 40% (Blue) of the participants were in the age group 18-20 years, 37% (Red) were in the age group 20-23 years and 23% (Green) were in the age group 24- 26 years.

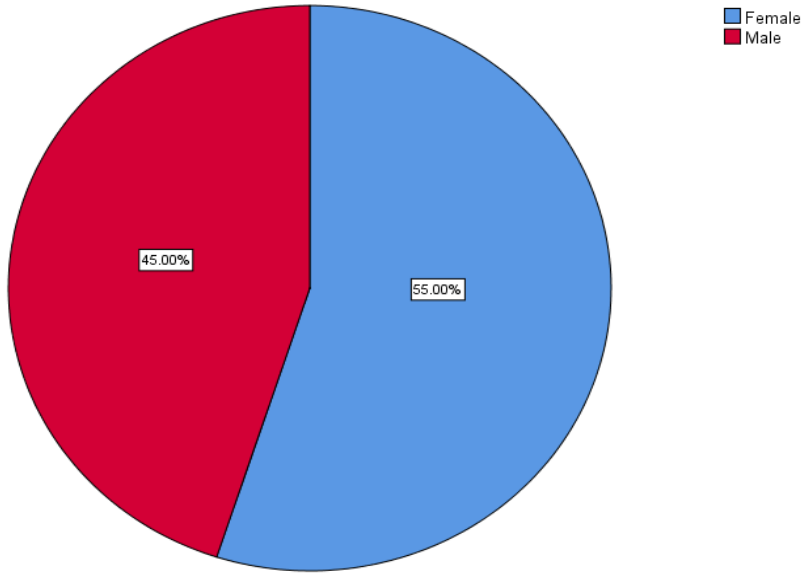


Figure 2 Pie chart represents gender of participants in the study which shows response for the question on gender. 45% (Red) of the participants were male and 55% (Blue) participants were female.

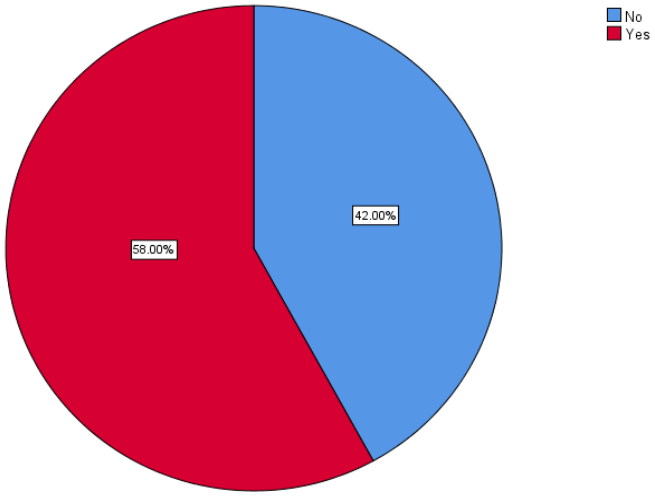


Figure 3 Pie chart represents awareness that the brain integrates multiple types of sensory information to achieve voluntary muscle control which shows response for the question on Awareness that the brain integrates multiple types of sensory information to achieve voluntary muscle control. 58% (Red) were aware and 42% (Blue) were not aware.

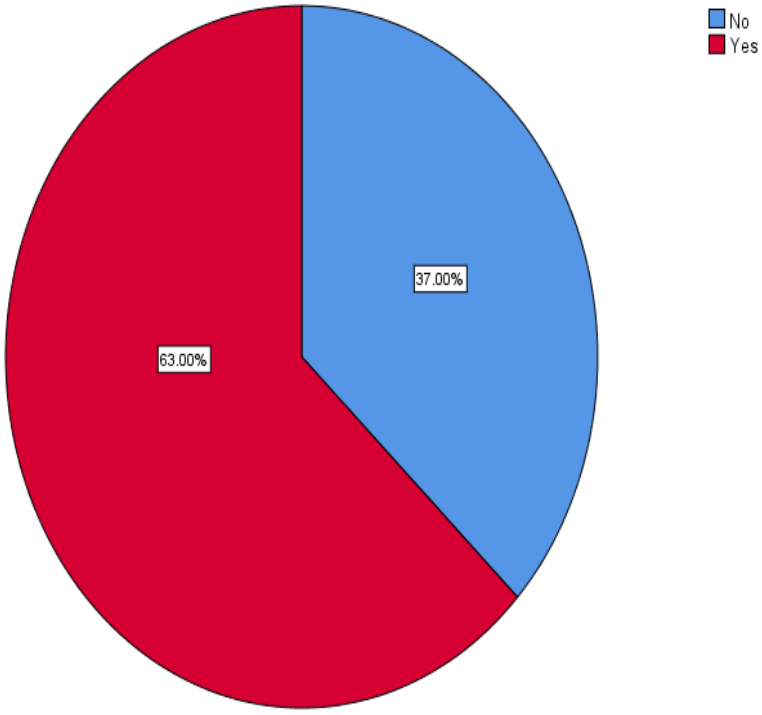


Figure 4 Pie chart representing the opinion on visual feedback method is as important as a sense of body position which shows response for the question on visual feedback method is as important as a sense of body position. 63% (Red) responded yes and 37% (Blue) responded no.

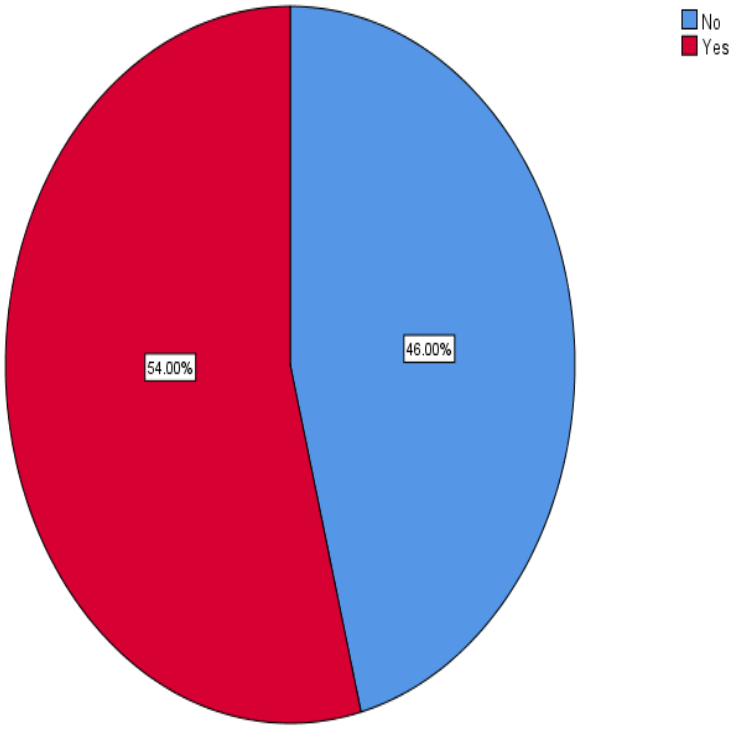


Figure 5 Pie chart representing the opinion on vision is mainly used to define trajectory and kinematic on reaching movements which shows response for the question on vision is mainly used to define trajectory and kinematic on reaching movements. 54% (Red) responded yes and 46% (Blue) responded no.

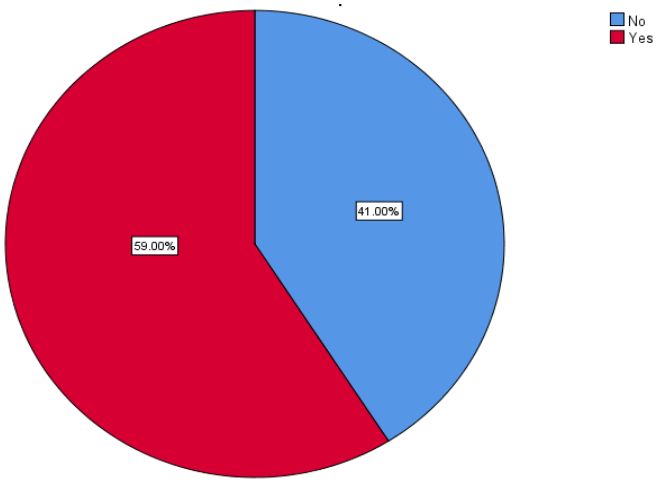


Figure 6 Pie chart representing the opinion on when visual feedback of initial position is distorted, systematic errors in movement endpoint are produced which shows response for the question on when visual feedback of initial position is distorted, systematic errors in movement endpoint are produced. 59% (Red) responded yes and 41% (Blue) responded no.

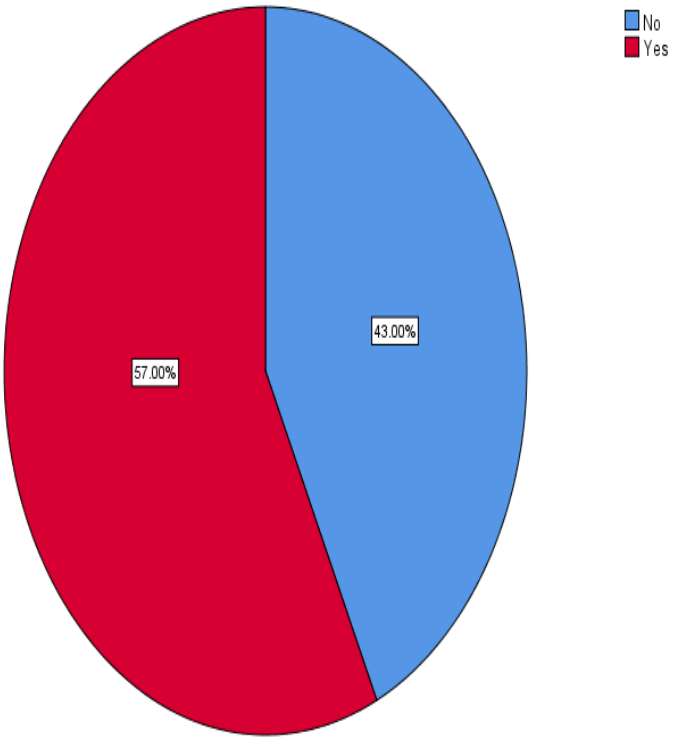


Figure 7 Pie chart representing the opinion on visual information is critical in determining static limb position which shows response for the question on visual information is critical in determining static limb position. 57% (Red) responded yes and 43% (Blue) responded no.

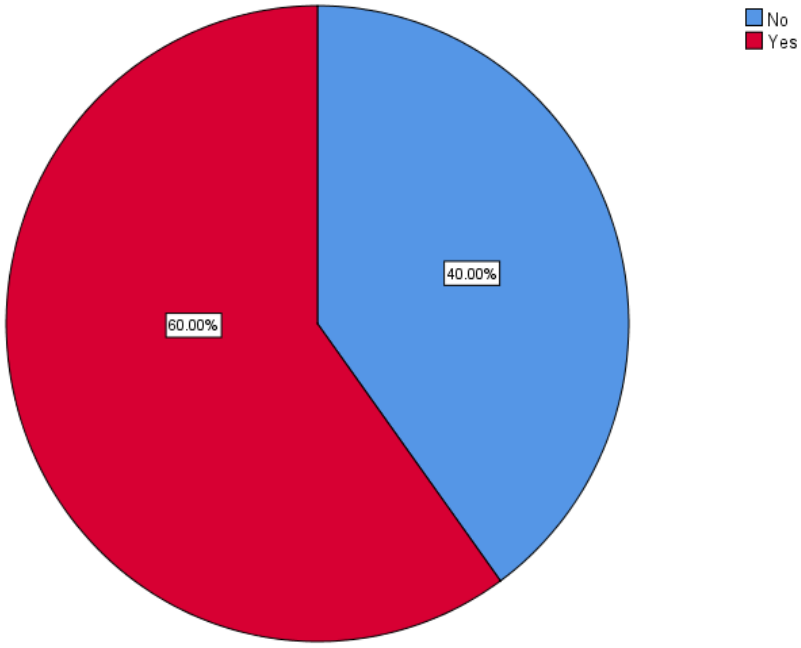


Figure 8 Pie chart representing the opinion on visual feedback method is effective during isokinetic exercise which shows response for the question on

visual feedback method is effective during isokinetic exercise. 60% (Red) responded yes and 40% (Blue) responded no.

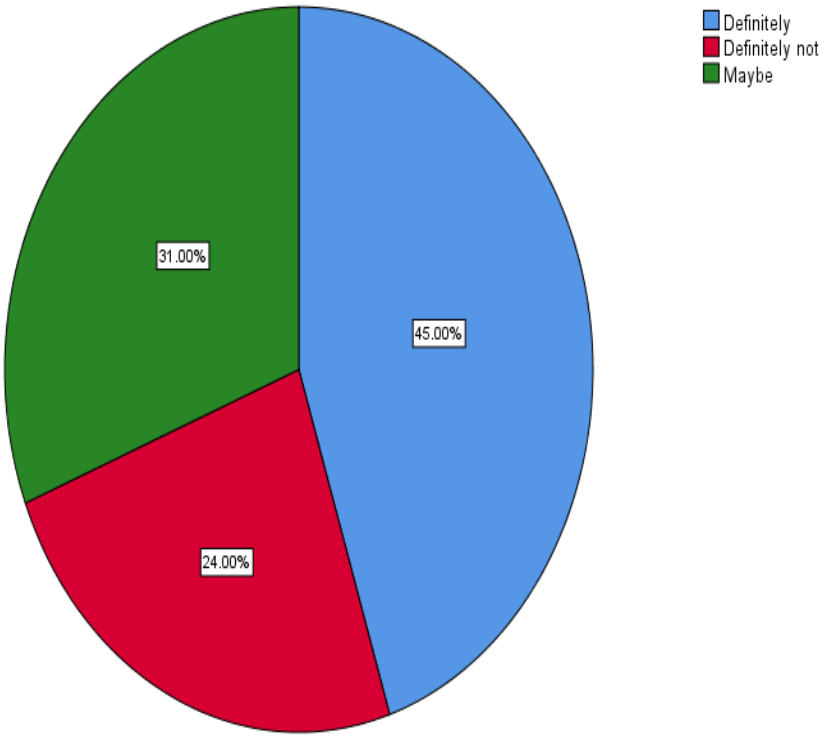


Figure 9 Pie chart representing the opinion on visual feedback method is advantageous in learning motor skills which shows response for the question on visual feedback method is advantageous in learning motor skills. 45% (Blue) think definitely, 24% (Red) think definitely not and 31% (Green) think maybe.

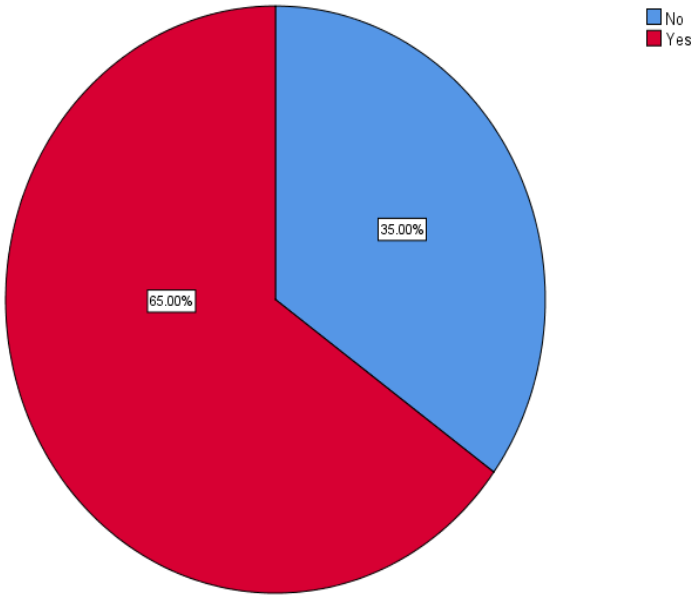
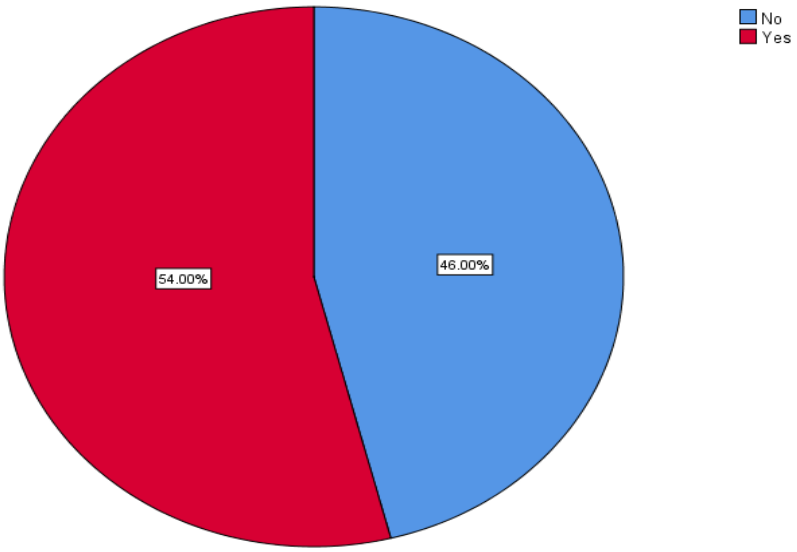


Figure 10 Pie chart representing the opinion on humans use continuous visual feedback methods to control fast reaching movement which shows response for the question on humans use continuous visual feedback methods to control

fast reaching movement. 65% (Red) responded yes and 35% (Blue) responded no.



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art representing the opinion on visual feedback from a mirror during movement may reduce self focused attention which shows response for the question on visual feedback from a mirror during movement may reduce self focused attention. 54% (Red) responded yes and 46% (Blue) responded no.

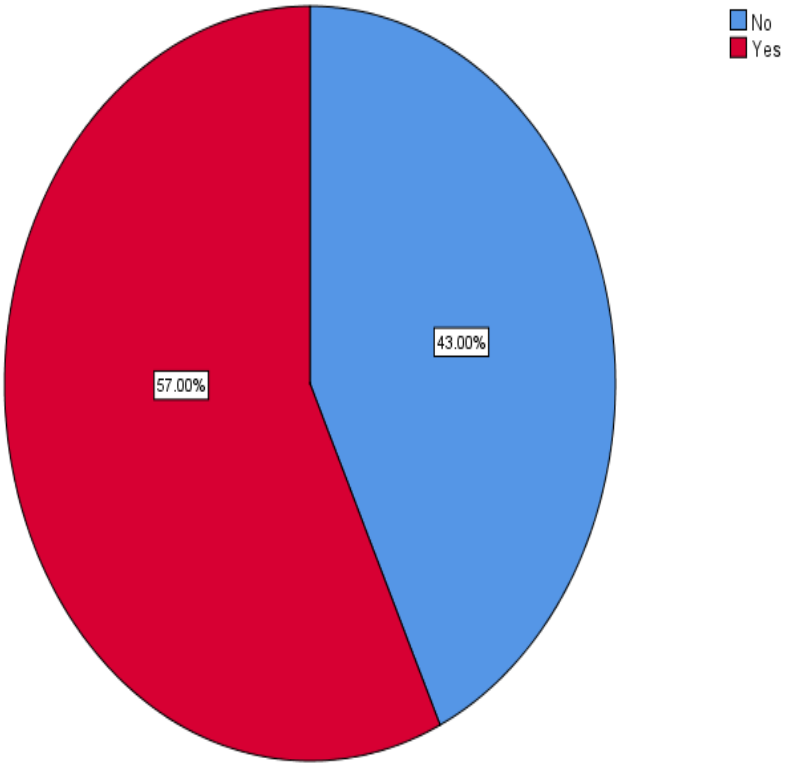

Figure 12 Pie chart represents awareness about the fact that biofeedback method can provide auditory, visual or sensory feedback which shows response for the question on biofeedback method can provide auditory, visual

or sensory feedback. 57% (Red) responded yes and 43% (Blue) responded no.

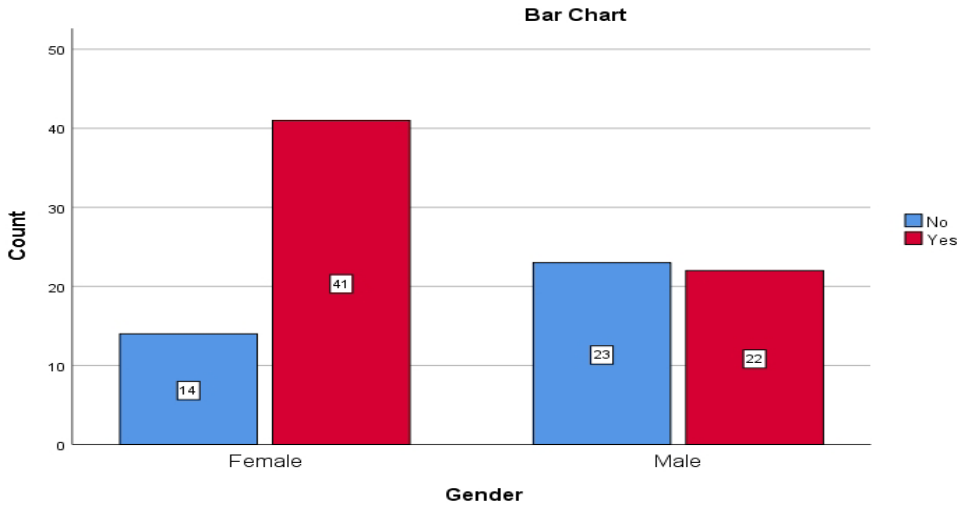

Figure 13 Bar graph representing association between gender and opinion on visual feedback method is as important as a sense of body position where red denotes yes and blue denotes no. X axis represents gender, Y axis represents the number of responses regarding visual feedback method is as important as a sense of body position. Out of 63% of the participants who responded yes, 41% constitute female and 22% constitute male. Hence females have stronger opinion on visual feedback methods is as important as a sense of body position than male. Chi square test was done and the association was found to be statistically significant. Pearson's Chi square value = 6.989, P value = 0.008 (<0.05) hence significant.

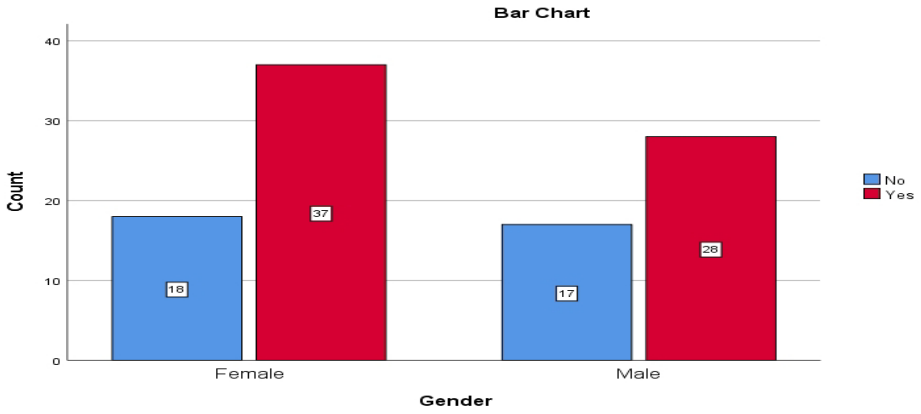

Figure 14 Bar graph representing association between gender and opinion on humans uses continuous visual feedback method to control fast reaching movement where red denotes yes and blue denotes no. X axis represents gender, Y axis represents the number of responses regarding humans uses continuous visual feedback method to control fast reaching movement. Out of 65% of the participants who responded yes, 37% constitute female and 28% constitute male. Hence females have stronger opinion on human use

continuous visual feedback methods to control fast reaching movement than male. Chi square test was done and the association was found to be statistically non-significant. Pearson's Chi square value = 0.278, P value = 0.598 (>0.05) hence non significant.

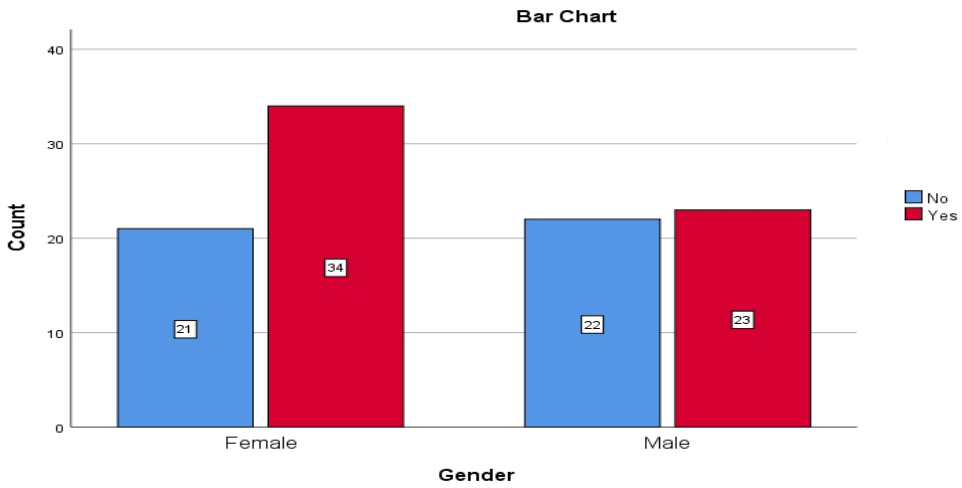

Figure 15: Bar graph representing association between gender and awareness that biofeedback method can provide auditory, visual or sensory feedback where red denotes yes and blue denotes no. X axis represents gender, Y axis represents number of responses regarding awareness that biofeedback methods can provide auditory, visual or sensory feedback. Out of 57% of the participants who responded yes, 34% constitute female and 23% constitute male. Hence females are more aware that biofeedback methods can provide auditory, visual or sensory feedback than male. Chi square test was done and the association was found to be statistically non-significant. Pearson's Chi square value = 1.402, P value = 0.282 (>0.05) hence non significant.

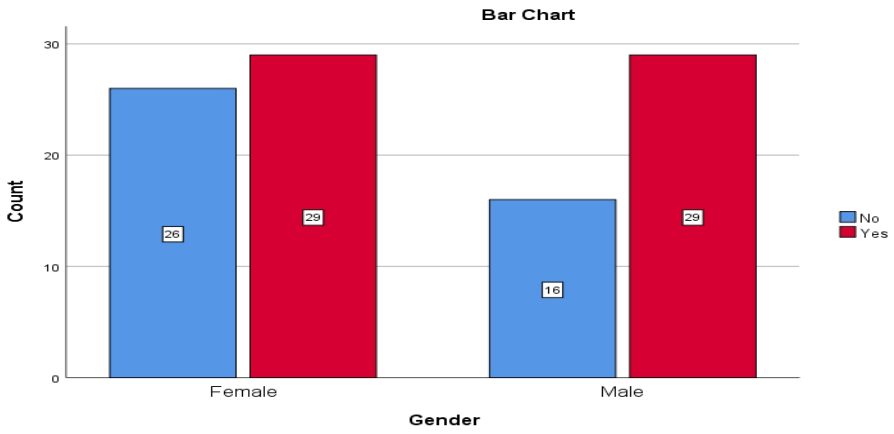

Figure 16: Bar graph representing association between gender and awareness that the brain integrates multiple types of sensory information to achieve voluntary muscle control where red denotes yes and blue denotes no. X axis represents gender, Y axis represents number of responses regarding awareness

that the brain integrates multiple types of sensory information to achieve voluntary muscle control. Out of 58% of the participants who responded yes, 29% constitute female and 29% constitute male. Hence both male and female are equally aware that the brain integrates multiple types of sensory information to achieve voluntary muscle control. Chi square test was done and the association was found to be statistically non-significant. Pearson's Chi square value= 1.395, P value = 0.238 (>0.05) hence non significant.

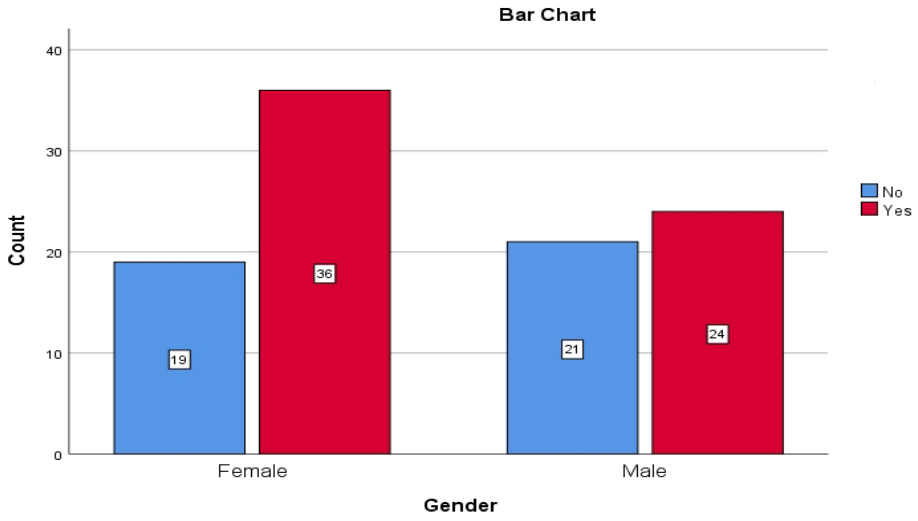

Figure 17: Bar graph representing association between gender and opinion on visual feedback method is effective during isokinetic exercise where red denotes yes and blue denotes no. X axis represents gender, Y axis represents number of responses regarding visual feedback method is effective during isokinetic exercise. Out of 60% of the participants who responded yes, 36% constitute female and 24% constitute male. Hence females have a stronger opinion that visual feedback method is effective during isokinetic exercise than male. Chi square test was done and the association was found to be statistically non-significant. Pearson's Chi square value = 1.515 , P value = 0.218(>0.05) hence non significant.

CONCLUSION

This study concludes that the majority of the study participants were aware that the brain integrates multiple types of sensory information to achieve voluntary muscle movements. But more awareness has to be created on the visual feedback method as we alter our body movements in response to changing cues in our daily life.

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